Pathways

VOL V APRIL—1983 No. 2

# STRAW EXPERIMENTS-(III)

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In the previous two issues of the Pathways (Dec. 1982 and Feb. 1983) you have read about ten straw experiments. This issue contains a set of five more straw experiments which are open-ended and allow some free wheeling to students in collecting observations and drawing conclusions.

## 11. RESONANCE AND FORCED OSCILLATIONS

Take three straws and tie them to a piece of thread. The two straws A and B should be of the same length while the third straw C should of half the length of straw A or B. Tie the free ends of the thread on to two clamp stands with some sag in the thread as shown in Fig. 11. Also attach two thumb-tacks to the lower ends of each straw.

Activities : (a) Oscillate straw A and comment on the oscillations of the straws B and C.

(b) Oscillate straw C. What do you observe now ?

(c) Shorten the length of straw B by 1cm each time and investigate how the amplitude of its oscillations changes when oscillations are fed from A to B.

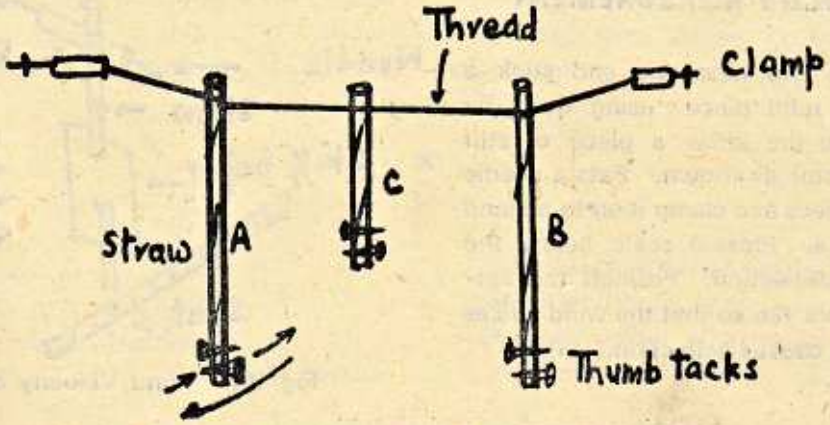


Fig. 11. Resonance and Forced Oscillations

## 12. ROLLING AND SLIDING FRICTION

Take a book and loop it up with a piece of thread. Attach the thread to a spring balance and drag it along the table. Read the measure of force needed to make the book just slide. Now, put some paper straws underneath the book and repeat the experiment.

Activities : a) Investigate how the limiting force of rolling friction changes with the number of straws.

b) Investigate how the limiting force of friction changes by putting additional weights on the book.

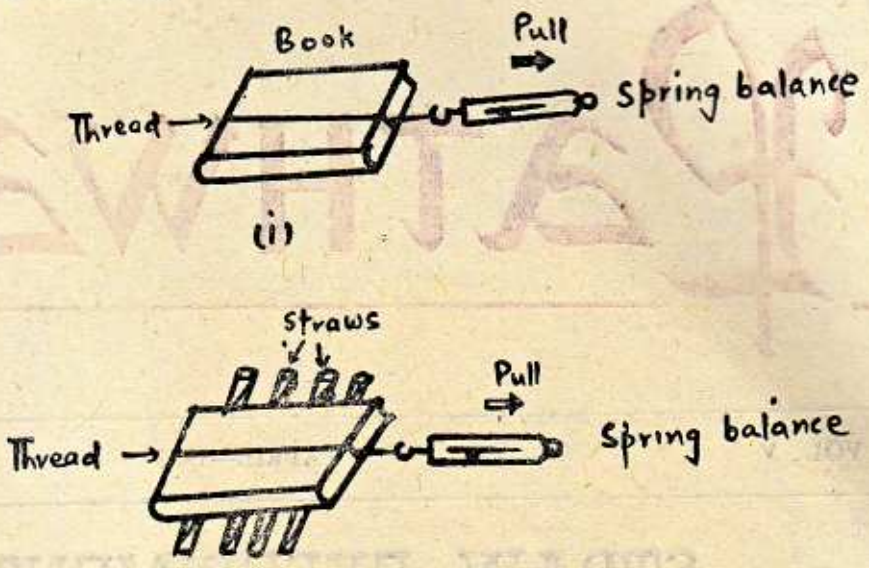


Fig. 12 Rolling and Sliding Friction

## 13. ACTION-REACTION PRINCIPLE

Take a piece of sand paper (30cm × 10cm) and place it on a table with some straws underneath. The rough surface of the sand paper should face up. Now take a clock-work toy car, wind it up fully and leave it on the sand paper.

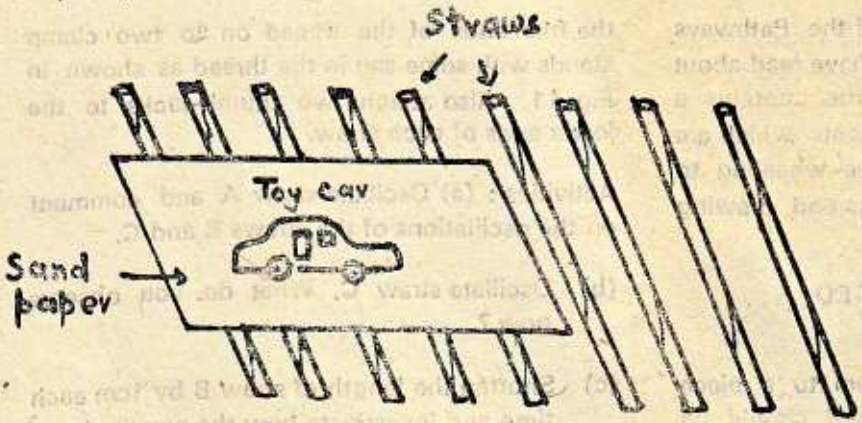


Fig. 13. Action-Reaction Principle

Activities : (a) When the car moves in the forward direction, in which direction does the sand paper move.

(b) Investigate how far the sand paper piece moves with a change in the distance between the straws.

(c) Investigate how for the sand paper moves with a change in its size.

## 14 WIND VELOCITY MEASUREMENT

Take a straw and near one end stick a plastic ball-pen refill piece using quick-fix solution. Slip on to the straw a piece of stiff paper (5 cm × 5 cm) as shown. Pass a needle through the refill piece and clamp it on to a stand as shown in Fig. 14. Place a scale below the straw to measure deflection. Position the set-up in front of a table fan so that the wind strikes the stiff paper and causes deflection.

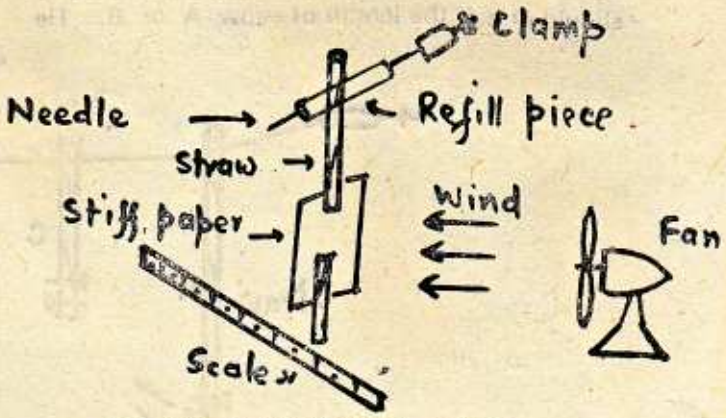


Fig. 14. Wind Velocity Set-up

Activities : (a) Investigate how the deflection of the straw changes with different speeds of the fan.
b) Investigate how the deflection of the straw changes with its distance from the fan.
c) Use the set-up outdoors to investigate the wind-velocity on different days.

## 15. RIGIDITY OF STRUCTURES

Stick several straws using Fevicol glue or quick-fix to form the triangular, rectangular, pentangular and hexangular structures Hang the structure on to a clamp stand and tie a scale pan to it. Load the pan till the structure gets out of shape.

Activities : (a) Investigate which structure gets deformed with maximum load.

b) Make another rectangular structure with a straw along its diagonal and investigate how it changes the rigidity of the structure.

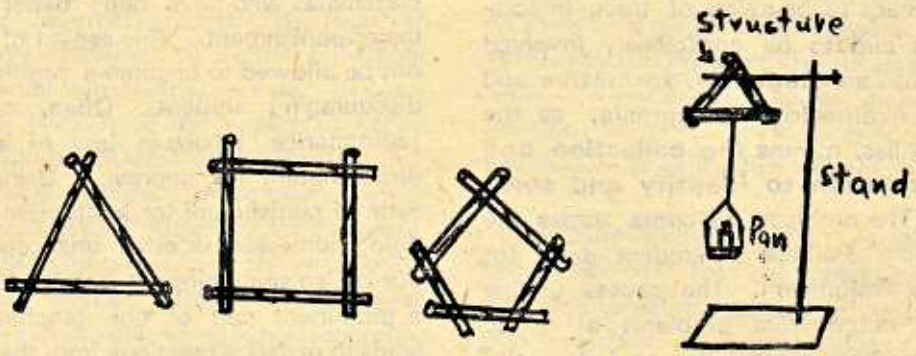


Fig. 15. Straw Structures

**Other Straw Experiments.**

Besides these fifteen experiments, straws can be used for a large number of experiments. These are listed here. 16. Straws for Bernoulli's Principle, 17. Straw Spray Gun, 18. Air has weight, 19. Moment of a Force, 20. Straw Pendulum, 21. Straw Air Screw, 22. Rolling-Axle Straw Micro-Balance, 23. Fixed-Axle Straw Micro Balance, 24. Straw Lever Balance 25. Straw Diver, 26. Straw Closed Organ Pipe 27. Straw to Show that a Sounding Body is in a State of Vibration, 28. Transverse wave Model 29. Longitudinal Wave Model, 30. Straw Clapper, 31. Straw Magnetometer, 32. Straw Current Balance, 33. Straw Pan Balance, 34. Straw 3-D Structures, 35. Straw Beam Bridge strength, 36. Straw Pillar Strength, 37. Plastic Straw Sticks to the Wall, 38. Plastic Straw Pulls Water, 39. Electrostatic Induction, 40. Straw C.G. Toy, 41. Magnetic Induction; 42. Electro-Statlc Merry - Go-Round, 43. Convection Currents, 44. Wind Vane, 45. Anemometer, 46. Moment of Inertia, 47. Sensitivity versus Stability, 48. Crystal Structures, 49. Straw Surface-Tension Balance.

I would be happy to hear from other teachers who have used straws in similar, improvised experiments.

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*To be astonished at*
*anything is the first movement*
*of the mind towards discovery*

*— Louis Pasteur*

*The world is full of willing people*
*Some willing to work*
*The rest willing to let them.*

*— Robert Frost*

# OH, THOSE TESTS !

Evaluation is an integral part of the teaching process. Why test ? When and how often to test? What kind of test items to use ? How to make tests valid, reasonable and fair ? These are but some of the many crucial questions that arise, All are difficult to answer, but all of them demand serious consideration.

In order to carry out intelligent evaluation, the teacher needs to be aware of three important processes and to be consciously involved in them. These are **diagnosis, formative** and **summative evaluation. Diagnosis,** as the term itself implies, **means the collection and use of information to identify and solve problems.** The problems we come across are of many kinds. Perhaps a student does not read a history assignment. The causes of this failure may range from problems at home, difficulty in reading to inability to follow the language of the textbook. A teacher may find that a large number of students in the class have not grasped a concept. This points to the need for a self-check. Is there another and better way of getting the idea across ? Have the students the necessary pre-knowledge or skills ? Do the objectives of the lesson need to be re-defined ? Thus **diagnosis tells us not only about the student, but about ourselves.** The diagnosis of learning problems goes on all the time-during and after regular classroom teaching.

**Formative evalution is the kind that takes place at the beginning or while a unit is developing.** It may take the form of a spot check or a quiz in the early stages of the lesson Informal observation, oral questioning in class and evaluation of homework help the teacher in modifying the course of the lesson, if it is needed. Remedial work can be undertaken if ptoblems are diagnosed. **Summative evaluation is what takes place at the end of a lesson or unit.** It determines whether the teacher has reached his or her objectives.

The function of tests is not however only to help the teacher in formative or summative evaluation. **Tests and grades can be used to motivate students and to give them valuable feedback about their achievements.** For those who do well, praise, good marks and commendation from parents and teachers are a reward. For those who fare badly, admonition by parents or teachers and the reactions of classmates who have done better are often, a major punishment. This aspect of tests should not be allowed to become a regular method of discouraging students. Often, repeated poor performance results in loss of interest and a disinclination to improve. Using tests as a form of punishment for inattention in class, not doing homework or other unacceptable behaviour is also something we indulge in. If this forms a prominent part of our teaching strategy, it leads to negative reactions from the students. The students will trust the teacher less, apart from developing a dislike for the subject.

The mature student can find tests an important information feedback which helps to locate his weaknesses. He or she can then work to overcome them. This aspect is of much more significance than reward and punishment. Giving frequent formative tests is a way of obtaining the maximum information about and for the students. A constant stream of short tests will aid instruction and improve learning. Testing, as the students progress through a unit is a powerful tool for the teacher. This is far better than giving only two or three summative tests in a term. The latter provide little information, which is usually too late for remedial work to be done. A word about grades would not be amiss here. The grades we give our students in their tests should reflect their performance in the test, They should certainly **not be influenced by the student's behaviour in or outside ciass.** These grades or marks are the only feedback available to the student, the parents and other teachers about the student's competence in **the subject.**

Readers might remember the earlier series of articles in PATHWAYS about setting and using behavioural objectives, Once the objectives are clear, **the tests given have to be related to the objectives.** What we are looking for is the level of mastery achieved by the students in terms of what we defined as our goals.

There are two principal types of tests we use the essay type and the objective type. The essay type test obviously needs an experi in the subject to correct it, There is often no absolutely correct or incorrect answer. The teacher judges the essay according to certain principles and against certain criteria that he sets. In contrast, objective tests need no expert to score them. A machine, a student or an aide can do this job with great accuracy by comparing answers with a given key. The results are therefore **objective;** not dependent on the subjective opinion of the teacher. Objective test items usually try to assess the knowledge, comprehension, application and analysis levels in learning. Essay type questions can be used to test not only these, but also the higher intellectual development of the student, including synthesis and evaluation. **What you wish to test for, will decide, what type of question you must choose** What kind of thinking are you looking for in the student ? Do you wish to check on whether he or she knows the basic facts ? Do yo wish to see if the student can analyse a situation similar to one discussed in class and offer a reasoned, critical opinion ? Do you wish the student to analyse and solve a scientific or mathematical problem ? Is it a familar or unfamilar type of problem ?

How does one set about writing a good essay question ? Part of the answer lies in how much creative thinking the teacher indulges in. However there are a few other points one could keep in mind. First, as the question must fit the objectives for the unit, it is a good idea to **draft the questions at the start of the unit.** This will ensure that the questions are relevant to what you expect from the students. As an esay question is intended to test for deeper understandings and higher-order thinking **try to avoid phrasing a question in such a way that the student can get by merely by reproducing facts.** Create, with the question, a problem similar to what has been done in class but one in which the student works on an unfamiliar situation or uses new data. **Good essay questions must be well-focussed, not too broad or diffuse.** A question like this, "Discuss the following concepts and ideas . . ." "often means ' write everything you know about or remember". The student should be quite clear about your intentions. To help the student **an essay question might even suggest the several concepts the student should use In the answer** Do not think of this as giving away the answer. What you are looking for is a demonstration of the ability to apply the concepts.

Another useful tip is to yourself **write a model answer for the question** This will help you to sift out unreasonably long or complex questions. Other questions can be modified and improved. A review of questions by a colleague and a classroom try-out (at least of similar questions) can also help you obtain valuable insights. Finally, consider whether one essay-type question is the best way of checking a whole unit If there are many objectives, a more satisfactory test would be to have three or four shorter questions. These will check on a larger portion of the unit It will also give the student a better chance, in case he or she 'spoils' the answer due to a lapse of memory or a lack of understanding.

When the essay-type question is being graded, one must attempt to seek ways of standardizing the procedure. One way, is to **set down the criteria right at the beginning, before you start the corrections.** Try to list the facts you want included, the type of reasoning, the conclusions to be drawn and allocate marks for each. Keep apart the marks you feel should be awarded for style in writing cogent argument, neatness and so on. The use of roll numbers instead of names is one way of reducing any personal bias which might creep in. One more idea you might like to try out-

what about grading a particular question in all the test papers before going on to the others and also shuffling the papers to change their sequence ?

Many students and teachers react to objective tests with a feeling that it is a hit-or-miss type of test. In a way this may be correct with respect to the 'true or false' type of question. The student has a fifty percent chance of being correct even if he is making random guesses. However, well-thought out objective tests can be quite useful and it is worth spending time on planning them. There are four main types of objective test items : i) the 'fill-in the blanks' type, which tests recall of facts and needs a very brief answer; ii) the 'true-false' type; iii. multiple-choice tests, and iv) matching items.

The 'fill-in' type of test, tests the memory of the student and unless your objectives lie only in this area, their use may be minimised. With 'true-false' questions, the doubt may always remain, whether the student knows the correct answer or has guessed it. Multiple choice questions, when carefully planned, can prove very good tests. In such questions there is a **stem** or a statement to which an **answer** and several **distractors** are supplied. Students may be required to complete the statement or respond to a question. The easiest type of multiple choice question is one where the stem is a direct question. Here is an example.

Ex. 1. The colour of hydrated copper sulphate is blue white pink green ?

Multiple choice questions can be written in ways which make a student **think**. Consider the following examples.

Ex. 2. Carbon dioxide

a) if bubbled through lime water will turn it milk
b) supports the combustion of burning magnesium
c) can be reduced
d) all of the above
e) none of the above.

As choices a, b and c are correct, but **only one answer may by ticked off,** the expected answer is d.

Ex. 3. Which of the following statements is **incorrect** ?

a) An acid must contain at least one atom of hydrogen.
b) Some acids contain more than twenty atoms of hydrogen.
c) The number of hydrogen atoms in an acid is its basicity
d) all of the above
e) none of the above.

Another type of multiple choice question may permit the student to **tick off more than one answer**. Here are examples.

Ex. 3. Catalysts

a) alter the rate of a chemical reaction
b) are not altered by the reaction
c) can alter the course of the reaction, without altering the final product
d) are not altered physically by the reaction
e) need not be present in exact amounts.

Here a, b and c are correct. However there may be some questions where, in spite of the above instruction, only one choice is correct. Obviously the student has to be alert,

Multiple choice questions can involve reasoning, like these one. Read the instructions carefully.

Read the statements made and decide two things : whether or not the facts given are correct, and whether the first fact in any way explains the second. Tick answer A if the facts are correct and one explains the other. Tick answer B if the facts are correct but one does not explain the other. Tick C if any fact is wrong whether one explains the other or not.

Ex. 4 : Ammonia is a gas, Therefore it dissolves in water : A, B, C.

Ex. 5 : Copper oxide is a base. Therefore it combines with acids to form salts : A, B, C.

Ex. 6 : Sodium chloride is a covalent compound. Therefore it does not conduct electricity : A,B,C.

In case you are not a student of science, here are the answers Ex. 4—B the facts are correct, but the second one is not explained by the first. Ex. 5—A The facts are correct and the first explains the second. Ex. 6—C. The first fact is incorrect.

Matching type tests should not be overlooked. Their usual format gives a set of items in the first column to be matched with a set of items in another column Another way, which is slightly more demanding, requires students to pair any two items in a given list.

Ex. 7 a) carbon dioxide

b) ferrous sulphide
c) turns lime water milky
d) anhydrous copper sulphate
e) oxygen
f) test for water
g) re-lights a glowing splinter
h) orange crystals
i) hydrochloric acid on this may give hydrogen sulphide
j) potassium dichromate.

The answers : ac; bi; df; eg; hj.

Readers will forgive me for not being able to produce examples from other subjects. I shall try to do so in another article.

What are the criteria for writing good objective tests ? Use clear, precise wording. Avoid long and complex sentences in the stem. Too many phrases and qualifying clauses should be broken into shorter sentences which are less confusing for the student. At the same time use enough qualifying words to make your meaning clear. Come to the point at once. There is no need to write introductory sentences or paragraphs.

Be careful that you have provided no accidental clues. The answer must not always be positioned in the same pattern. The sequence of answers and distractors must keep changing. Inter-related questions may also contain such clues. Have a colleague check your test and also check that it is consistent with your original objectives

A judicious mix of different types of objective tests with essay-type question will help us to test our students fairly. In the examination paper, our attempt should be to 'cover' a wide a portion of alloted syllabus so that we get a proper feedback on the students' achievements. It certainly need a lot of thinking and hard work on our part.

—Gayatri Moorthy

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## HOW POWERFUL ARE YOU ?

Most people associate power with muscles; the better a person's muscular development the more powerful he or she usually is. Let's investigate this relationship. Work is the amount of force required to move an object multiplied by the distance the object is moved Power is the rate at which work is done. We used to describe the rate at which work is done with the unit horsepower (which made sense given the importance horses used to have in doing the world's work). Under the metric system, the watt, named after James Watt. the developer of the steam engine, is the standard measure.

How many watts can your body generate? To find out you must do physical work, plus a little mental work. Begin by measuring the vertical distance, in metres, from the bottom to the top of a flight of stairs. The amount of work you do to ascend the stairs is equal to your weight in kilograms, multiplied by the vertical height of the stairs in metres. Measure the time it takes to ascend the stairs in seconds. Power depends on how fast this task can be accomplished. Use the formula to calculate the watts you generate:

$$\text{Power (in watts)} = \frac{\text{(your weight) (vertical height of stairs) (9.8)}}{\text{time needed to ascend stairs}}$$

The figure of 9.8 must be included to account for the acceleration of gravity.

There are other questions to be investigated regarding power. Can being too muscular decrease your power ? Do tall people generate more power than shorter ones?. Do long-legged people produce more power? Does your power decrease after several runs up the stairs? What shape would a graph of ten consecutive trials take? Measuring pulse or respiratory rates after climbing stairs are two natural extensions of this activity. ●

# CUTE EGGS

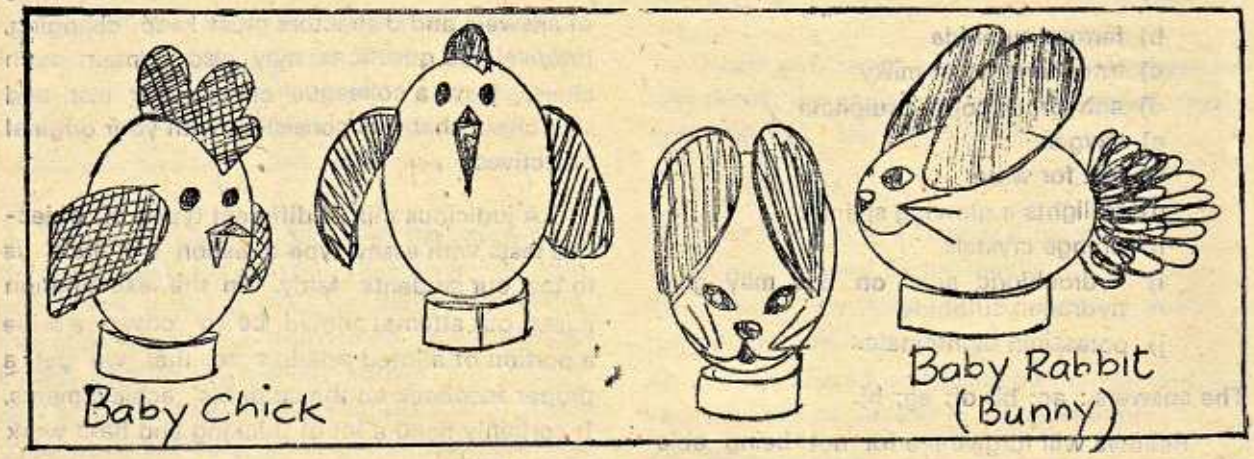
**Materials Needed :** Empty eggs, You can blow out the contents by making a hole at each end. Or else, use eggs that have not been too badly damaged. Wash by soaking in water and dry in the sun, to prevent any unpleasant odours.

The baby chick has a comb and wings cut out of jute or any other textured fabric. These are glued into place. Cut the beak from coloured paper, fold and glue on.

The bunny has petal-shaped ears glued on. The tail is made of bits of white wool.

Eyes and nose are put in with a black felt pen.

A strip of paper made into a ring provides the stand for these 'cute eggs'.




( From Teach—in produced by the Springdales Teachers Centre. )

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## MARTIAN IMAGININGS

Have students pretend they are Martians who have travelled to earth to study animal life on this planet. They have focused their study on large rectangular black areas, many of which have a sign reading "parking" in front. They have been observing many hard-shelled creatures of varying sizes and colours arrive and depart from these areas every day. The Martian scientists agree that after the hard—shelled creatures arrive and stop, a soft creature moves out of a hole in the side of the shell and walks off into larger, box-like structures outside the large black area.

The scientists are divided on what kind of creatures these are. One group argues that both the hard and soft creatures are manifestations of one single creature (related, perhaps, to Earth's garden snail) which can leave its shell behind for long periods of time. Other Martian scientists insist that the creature is related to the lichen family in that it display symbiosis between two different organisms. These scientists have observed that when the softer creature leaves the hard-shelled one, all signs of life stop in the larger, hard-shelled creature. When the soft creature returns, the entire organism comes to life and moves off rapidly.

Which position do your students, as Martians, think is correct ? Have them write down as many arguments as they can think of to prove their position is right and the other position wrong. Have students share their reasoning with the rest of the class. ●

# Training Young Conservationists

There is an increasing need to make young people aware of the resources of this world we live in, how delicate natural balances are upset by Man, and what each one of us can do to help. **Awareness starts right down in the primary school**. While many schools claim to have an organised environmental studies programme, what often happens is that Environmental studies becomes another subject. There are textbooks of environmental studies; children learn the facts given in them and most often write tests as well. What is missing in the above model is **involvement of the children in activities which will lead to the acquisition of factual knowledge and also the skills of observation, classification, r cording and so on**. Inbuilt into such activities must be a component which develops in the students an awareness of the world around them and all the beautiful things in it; a desire to look after those things and some knowledge about how this is to be done.

In this series of articles, some suggestions, are given for primary classes. As the objectives given are very broad, teachers must seek every available opportunity to work towards them. In the primary classes, some degree of flexibility is available to the teacher and he or she can take advantage of situations as they arise. The inculcation of this awareness may take place during a nature walk, during a discussion in science or social studies, during a class picnic or perhaps as a planned part of the daily routine.

**Class I; Looking at the Environment**

**Objectives :** The student will be able to

1. develop an awareness of the immediate natural environment—plants, animals, rocks, air, water and soil found at school, in the neighbourhood or in the community;

2. observe the changes in the natural world—how sizes, shapes, colour sounds, smells, textures and animal activities vary with the seasons;

3. understand and point out some of the inter-relationships among soil, plants, animals, people, water and air;

4. list examples of how people, depend on soil, water, plants, animals and air;

5. point out why people must know how to take care of these things porperly;

6. learn and practise what they can do to make their environment cleaner, more healthful and more beautiful.

What is the school environment of a child of class I ? It is partly the classroom and all that it contains: but it also the school garden or playground; the road on which the school is located and

all that can be found there. A walk around these areas to familiarize new entrants into schools is often recommended. This could be repeated more than once, so that apart from knowing where offices, toilets and classrooms are located, children will locate and identify trees, flowers, birds, animals and natural features in the garden etc. A closer look at the lawn will reveal the existence of insects of various kinds—ants, earthworms, ladybirds, spiders and so on. Lists in words or in pictorial form may be maintained in the class. Talk about how these things affect the lives of the children Simple classification can start by grouping together similar things

As the term progresses changes in the weather and the season provide a take-off point for observations on changes in the environment. Charts showing what actually happens to the plants, the insects, the soil and rocks in the neighbourhood can evolve from joint efforts In the class. Observe what happens when it rains—what patterns the rain forms on glass window panes, on telephone wires, on trees and on the earth. What changes take place in the insects seen in or near the school How do plants react to the rain ?

Samples of soil collected from three different areas in the school or neighbourhood may be compared for different areas in the school or neighbourhood may be compared for differences in colour and texture Seeds and leaves can be collected and classified for a classroom display—**without damaging plants,**

The interdependence of plants and animals can be studied using a classroom aquarium or terrarium. Grow plants in pots in the classroom window and keep records. This provides a valuable exercise in careful, observation and recording and provides scope for lots of conversation.

Apart from this, preserving the environment, looking after it, can start within the classroom. Keeping it clean and tidy, picking up bits of paper and other waste, are daily exercises which should soon become habits. Keeping flowers in a vase provides an opportunity to let children learn that flowers look best in a garden The vase can hold one or two flowers only, to be brought in turns by different children so that one garden is not totally destroyed.

These are only some ideas. We are sure that you will have many more, One important aspect to keep in mind is that apart from getting involved in completely planned activity, children of class-I need a chance to discover for themselves. The must also express themselves—in pictures, in actions and orally. Only then can the messages go home. Now that many of you will be meeting a new class, at the start of an academic year, here is the right opportunity to start training the conservationists of tomorrow.

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# A Report of a Science Symposium

The Science Department of St. Thomas' School, New Delhi operates on the philosophy that it is necessary to inculcate amongst students a spirit of scientific enquiry and an awareness of contemporary scientific advances, apart from instructing them in the formal curriculum. For sometime, we had felt the need to do something about this with the students of the middle school, especial'y as most symposia or debates on scientific topics have, so far, concentrated on the +2 level. There has been a lack of organised scientific activity for the middle school To fill this gap and arouse their interest, we decided to organise a symposium exclusively for them.

The topics were chosen with much care—The Mighty Atom, Wealth from Waste, The Computer Revolution, When Oil finishes-Then What ?, and Conserving Nature. The students were allowed to talk for seven minutes and five minutes were allowed afterwards for a question-answer session. The audience would thus be exposed to a range of subjects of present-day interest and could also participate in the programme.

While we were unable to send out as many invitations as we would have liked to, the response from other schools was good. The following schools participated, sending teams of two students each—St. Columba's School, the Convent of Jesus & Mary, Springdales School, Ramjas School (Pusa Road); D.T.E.A. School (MandirMarg), Mt. St. Mary's School, Air Force Central School and Bluebells School. Three judges were invited—Mrs. Panchapakesan from the Central Institute of Education, Mr. Gupta from the Indian Institute of Agricultural Research and Mr. Singh from the Science Centre (Link Road).

The speakers were well prepared and spoke with informed authority. The children participated with much enthusiasm, as was evident in the very lively question and answer sessions. It was heartening to see the speakers face these questions competently and with confidence.

The results declared were as follows :

Kesang Menezes (Convent of Jesus & Mary) stood first, speaking on 'Wealth from Waste'. Next was S. Marini of St. Thomas' who spoke on 'Conserving Nature'. The Springdales School team was adjudged the best with its two speakers-Subhashini and Bhavna Tangri speaking on Conserving Nature and The Mighty Atom respectively.

Ms P. Harkauli
St. Thomas' School,
New Delhi

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## WHAT'S IN A NAME ?

The terms billion, trillion and quadrillion are sometimes used to express large numbers. But American and British practice gives different meanings to these numbers. Do you know that

| | in Britain and Europe | in the U.S.A |
|---|---|---|
| One billion | is million x million ($10^{12}$) | is thousand million ($10^{9}$) |
| One trillion | is million x billion ($10^{18}$) | is million x million ($10^{12}$) |
| One quadrillion | is million x trillion ($10^{24}$) | is million x U.S. billion ($10^{15}$) |

# TIT BITS

Did you know about

PLAYS FROM INDIAN HISTORY—a delightful book based on stories about Mohenjo-Daro, the Buddha, Chandragupta and other historical figures. Each play is perceded by a short introduction and can be performed by children in the 8-12 age group. Written by Susan Gole, illustrated by Savitri Jatar, it is published by Arnold Heinemann and reasonably priced at Rs. 7.50

*READING by Ayesha Chatterjee. This little booklet costing Rs. 8/- is accompanied by a set of flash cards of the hundred most commonly used words (cost Rs. 32/-). Both are available from the Progressive Educational Techniques Society (Teacher's Centre), 7, Middleton Row, Calcutta 700 071. Write to the coordinator, Ms. Vinu Gogia.

***TAPED LESSONS** covering the syllabus in HEAT FOR CLASS 7 are available at Springdales Teachers Cente. Teachers in Delhi, who are interested in trying these out with their classes, please contract Mrs. Saroja Sunderarajan, Director of the Centre.

*Goodyear have a beautiful **COLOUR FILM ON THE TAJMAHAL** directed by James Messenger. Some of you (in Delhi) may have seen it on TV on March 6th this year. Contact Goodyear Public Relations, New Delhi Phone 636567. The film appears suitable for older children.

**बबर शेर** makes delightful reading for children. It is a quarterly Hindi newsletter on wildlife' natural history and the environment, aimed at the age group 12-16 years. Printed in one colour with line illustrations, it includes facts as well as folk-lore and history. It is published by the Environmental Services Group (ESG) which is a Delhi based, non-profit, environmental studies wing of the World Widlife Fund-India. The first issue (January 1983) is being distributed free of cost to interested schools.

The subscription, when introduced, will be nominal. Contributions are invited from students compositions, poems or line drawings. f accepted, the student will be rewarded with a book. Contact : Ms. Shama Chowdhury, Environmental Services Group (World Wildlife Fund-India), B/1, L.S.C. (First Floor), J-Block, Saket, New Delhi-110017.

ESG will also be happy to arrange a 'slide-talk' on wildlife and introduce Babbar Sher to the children of your school.

*MANDARA EDUCATION CENTRE, 13, Temple Avenue, Srinagar Colony, Saidapet, Madras-600 015. This is a group working in alternative education and running a learning venture for children in a fishing community in Madras. They would like to relate with other groups having similar interests. They have just started a Resource Centre to study and analyse the formal non-formal educational systems and thereby evolve new creative, cultural and relevant ideas.

*THE CBT BOOK CLUB, for children. Annual Membership is Rs. 100/- and they offer all books published by the Children's Book Trust in 1983 plus issues of their monthly magazine, Children's World. The address : 4, Bahadur Shah Zafar Marg, Nehru House, New Delhi-110002.

★ ★

## GRUMBLE, GRUMBLE

G—R—U—M—B—L—E
Grumblers from gloom are never free
If it's sunny, they want rain,
In rain they want sun again.
Their own lives sad, they can and do
Make other's lives unhappy too.

—Mini Kaker
St. Therese High School
Presentation Convent Delhi

# संस्कृत साहित्य में सौन्दर्य-प्रियता

## [संस्कृत प्राजोना-कार्य]

लोगों के मतानुसार संस्कृत आजकल की एक उपेक्षित भाषा है पर आज भी विशद साहित्य से परिपूर्ण इस सरस भाषा का छात्राएँ रूचि पूर्वक अध्ययन हैं । उनकी रूचि का सजीव प्रमाण है — **सेंद थॉमस विद्यालय की दशम एवं एकादश कक्षाओं की छात्रों द्वारा किया गया प्रायोजना कार्य** । प्रायोजना कार्य का विषय था — संस्कृत साहित्य में सौन्दर्य–प्रियता ।

द्वितीय सत्र के प्रारम्भ में सभी छात्राएँ इस विषय पर रोचकातिरोचक सामग्री प्रस्तुत करने के लिए प्रयत्नशील हो गएँ ? सारी कक्षा को छोटे-छोटे समूहों में बाँट दिया गया । विषय को चार भागों में विभाजित किया गया — 1. वैदिक काल 2. रामायण काल 3. महाभारत काल 4. परवर्ती काल (मुख्यत: कालिदास के नाटक तथा कथा साहित्य) । प्रत्येक काल में जिन चार मुख्य बिन्दुओं पर उन्होंने सामग्री एकत्रित को थी,वे थे — (1) **वस्त्र** (2) **केश विन्यास** (3) **अलंकार** (4) **सौन्दय–प्रसाधन** ।

इस प्रायोजना कार्य में जो मुख्य बाधा छात्राओं के सामने थी, वह थी — पुस्तकों का अध्ययन करने के लिए उनके पास अपर्याप्त भाशा ज्ञान । पर उत्साहित छात्रओं ने इस बाधा को बाधा न मानते हुए कार्य प्रारम्भ किया । उन्होंने वैदिक साहित्य की पुस्तकें, मूल वाल्मीकि रामायण का हिन्दी अनुवाद, महाभारत का हिन्दी अनुवाद तथा विभिन्न नाटक अभिज्ञानशाकुन्तलम्, मृच्छकटिकम्, उत्तरामचरितम् स्वप्नवासवदन्तम् तथा कादम्बरी के हिन्दी अनुवादों का अध्ययन किया ।

लिखित सामग्री को आकर्षक ढंग से प्रस्तुत करने के बाद चित्रण हेतु कुछ चित्र तो उन्हें प्राप्त हो हो गये थे, कुछ कल्पनात्मक चित्र भो उन्होंने चित्रत किए। इस प्रायोजना काय के लिए छात्राओं का **'राष्ट्राय संग्रहालय'** का भ्रमण भी सहायक सिद्ध हुआ ।

छात्राओं के उत्साहवर्धन के लिए तथा प्रायोजना कार्य को उनके पाठ्क्रम का एक अंग मानते हुए छात्रओं को अंक देकर उसका मूल्यांकन किया गया ।

उनके प्रायोजना कार्य के कुछ अंश यहाँ प्रस्तुत हैं —

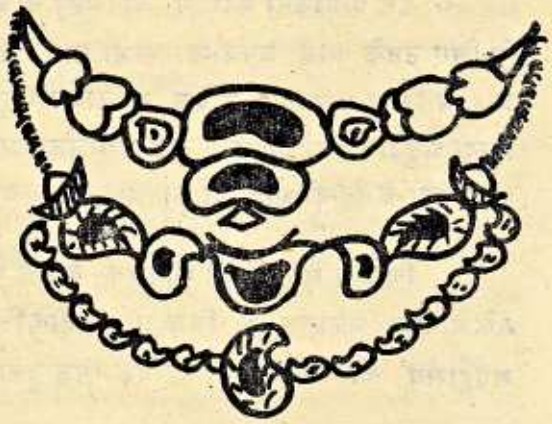
उपविषय — कालिदास के समय में सौन्दर्य प्रियता —

(1) **वस्त्र** — कपडे चार प्रकार से बनाए जाते थे । पहला प्रकार वल्कल वस्त्रों का होता था, जो पेड़ों की खालों से बनाए जाते थे । इन्हें तपस्वी पहनते थे । दूसरी किस्म गूदे से बनाए गए वस्त्रों की थी, जिसमें कपास भो शामिल थी । तोसरी किस्म रेशमी वस्त्रों की थी । इन्हें कौशेय वस्त्र कहा जाता था । चौथा प्रकार पशुओं के बालों से बनाए गए वस्त्रों का था, ये ऊनो वस्त्र होते थे । सूती कपड़ों का बड़ा केन्द्र मथुरा में था ।

अलग अलग ऋतुओं में अलग अलग वस्त्र पहने जाते थे । गर्मियों में मलमल तथा सर्दियों में रेशमी और ऊनी वस्त्र लोकप्रिय थे । पुरुषों के वस्त्रों में उत्तरीय और निम्न परिधान, दो कपड़े होते थे जिन्हें आजकल धोती और चादर कहते हैं । स्त्रियों को पोशाक में तीन वस्त्र होते थे—ऊर्ध्ववस्त्र, अधोवस्त्र और दुशाला ।

(2) **केश विन्यास** – महाकवि कालिदास के समय में बालों को घुँघराला बनाने का सबसे अधिक प्रचलन था। ऐसे बालों को अलक कहा जाता था। केशों के सँवारने का फैशन इतना अधिक था कि इसके कई नाम प्रचलित हुए जैसे 'कुञ्चित केश' चूर्ण कुन्तल आदि। महिलाएँ अपने बालों का 'स्नान-काषाय' (शैम्पू) से सुवासित करती थी। इन्हें अगरु के धुएँ से काला भी किया जाता था। विभिन्न प्रकार के केश विन्यास प्रचलित थे जिनमें से एक दिये गए चित्र द्वारा स्पष्ट है।

(3) **अलंकार**— सिर पर पहने जाने वाले आभूषणों में चूड़ामणि, रत्नलाल, मुक्तावली, किरीट प्रसिद्ध थे। गले में हार व मुक्तावली पहनने का रिवाज़ था। कलाई में वलय तथा कमर में रत्नजटित मेखला पहनी जाती था। स्त्री एवं पुरुष दोनों ही अगूँठी पहनते थे तथा अगूँठियों पर नाम खुदाने की भी प्रथा थी। स्त्रीयों पैरों में नूपुर पहनती थी। फूलों द्वारा भी स्त्रियाँ अपना शृंगार करती थी। आभूषणों के कुछ चित्र प्रस्तुत हैं।



(4) **सौन्दर्य प्रसाधन** — सौन्दर्य प्रसाधनों के रूप में चन्दन, अगरु, लाक्षारस, सिन्दूर आदि प्रचलित थे इस प्रकार छात्राओं द्वारा किया गया प्रायोजना कार्य निश्चय ही पूर्ण रूप से सफल रहा।

अनुपमा कुलश्रेष्ठ
संस्कृत विभाग
सेंट थॉमस विद्यालय, देहली

★ ★ ★

I shall pass
through this world but once
Any good thing therefore
that I can do

Or any kindness
that I can show
to any fellow creature,
Let me do it now;

Let me not defer
or neglect it,
For I shall not
pass this way again.

# Something for Think about

Dr. Lilian Katz, Professor of Early Childhood Education, University of Illinois, worked in M. S. University, Baroda, in the early part of this year as a visiting Fulbright lecturer. We reproduce below notes of a seminar held at Baroda, which we feel might be of interest not only to pre-primary or kindergarten teachers, but also to all of us interested in education. We are grateful to Dr. Katz and to the United States Education Foundation in India for permission to print this material.

—Editor

We have touched on many topics concerning the lives of children and teachers. We still don't know enough about how to achieve 'the good life' for all. But as you prepare to take up your various posts and pursue your chosen careers, keep these things in mind :

1. Identify as clearly as you can what your own assignment is, and what is yours to do—**and do it well.** Do your own job as whole-heartedly as you can. Don't drain your energy blaming history, tradition, bureaucracy, politics, administrators, parents, and so forth. **You are with the children for a small portion of their lives; make that portion count by giving it all you have !**

2. Remeber that adults know more about almost everything that the small child does—**except, what it feels like to be that chid,** how the world looks and responds to him or her Therein precisely lies the child's expertise from which the teacher must learn in order to be able to teach.

3. **Cultivate the habit of speaking to children as through they are people**—people with minds, usually active and lively ones. It is not necessary to be sweet or sentimental with children at one extreme, or sombre and solemn at the other. It seems advisable to be serious and thoughtful about them and with them.

4. **Keep in mind the distinctions between interrogation and solicitation,** An interrogation is a question you know the answer to. A solicitation is a question which asks children (or adults) for their views, ideas, opinions, reactions recollections, suggestions, hunches, preferences, comments and so forth. Interrogations are unidirectional and intimidating, solicitations are conversational and inviting.

5. Remember that **meaningful relationships have to have content**. The content of our relationships with children should be about relevant phenomena and events around (and within) them. Our tasks include engaging their minds in improving their understandings and knowledge of these relevant phenomena.

6. **Remember that significant learning and development take time.** Change does not ! We can change behaviour quickly by using threats, punishment or force. But when these are removed there is no real development. Remember also that it is very difficult to grow around impatient people !

7. Teaching usually involves numerous conflicting pressures and situations. You cannot respond fully to all of them. **Decide what is worth making an issue over** Don't make an issue over everything. Select those issues that really matter (to you). A half-a-dozen will do ! If you have too many, you won't get around to the really important content in your relationships. Once you've picked your issues, take your stand on them with clarity and courage for the sake of the children, for your country, and for all mankind.

8. In teaching, all we have at a given moment in a given situation is **our own very best judgement.** Throughout our professional lives we study and reflect in order to **refine that judgement ;** we exchange with colleagues, examine

the evidence, look at other solutions, make up our own-all in order to improve our professional judgement. In the last analysis our own very best judgement is all there is.

9 **See yourself as a developing professional** That is : become a student of your own teaching—a life-long student of it.

10. Never take someone else's views or opinions of you or your work more seriously than you take your own ! Take others' views seriously—you have much to learn from them but **not more** seriously than you take your own, for that is the essence of self respect. And children need the company of self-respecting adults.

11. **Cultivate your own intellect and nourish the life of the mind.** For teachers, the cultivation of the intellect is as important as the cultivation of empathy, caring and understanding not less or more-but equally important.

12. For teachers it is useful to strive to maintain a balance between having sufficient scepticism to go on learning, and sufficient conviction to go on acting—for to teach is to act. **To teach effectively requires optimum confidence in the rightness of our ideas and methods.**

13. It seems to me that we cannot have optimum environments for children in classes (and homes) unless the environment is also optimum for the adults. Certainly on some days what is optimun for the children is obtained at the expenses of the teachers, and on others, vice versa ! **But on the average on a day-to day basis, both children and adults must find their lives together interesting, engaging, satisfying and worth living.**

14. **Never underestimate the power of ideas** ! Ideas are distinctly human creations, and if they were not powerful many individuals would not have been imprisoned, exiled, banished, burned at the stake, crucified, executed, or assassinated. All the world, but India especially, is better off for the power of the ideas of of Gandhiji.

15. Always assume that the people you work with have the capacities for creativity, insight, courage and greatness. Sometimes the assumption will be wrong, perhaps. But if you always make it, you will be much more likely to **uncover, strengthen and support these capacities in others.**

16. The great struggle of our time-and no doubt for generations to come - is the struggle for **equality**. But equality of what ? People are not equally tall, or equally musical or mathematical or beautiful - but they are equally **human** in the sense that they all want to be treated with respect and dignity; they all want to really matter to some others, to be loved and cared about by at least a few; they all have dreams, hopes, wishes, aspirations, fantasies, fears, and doubts, like us. In these ways, it seems to me, all of us, all the world's people **have much more in common than they have apart.**

17. This struggle is also for equals access to 'the good life'—the feelings that life is enriching, satisfying, and worth living in the long term. And it may be that it is the aesthetic dimension that accounts for the quality of 'the good life'. As H.S. Broody has pointed out, aesthetics have to do with the elaborations upon the basics : those elements of form texture, pattern, colour and sound above and beyond the instrumental requirements for mere survival and that serve to alleviate the tedium. It is the aesthetic dimensions that transform running into dance, shouting into song, noice into rhythm, houses into homes, reproduction into romance, growling into poetry and eating into dining.

18. Finally, I have tried to offer my own views of what education is about. To me it is about **the life of the mind in its fullest sense**. It is about cultivating and developing in the young certain characteristic ways of responding to experience—dispositions, if you wish These ways should include : **the habit of reflection, the quest for insight and understanding, the search for evidence.** They should include **inventiveness, resourcefulness, tenderness, courage, compassion and some humor as well** ! But I leave you with R. S Peter's definition of education which sums it up well :

"To be educated is not to have arrived at a destination, it is to travel with a different view. What is required is not feverish preparation for something that lies ahead, but to work with a precision, passion and taste at worthwhile things that lie at hand."

# HAPPY NUMBERS

You must have heard of amicable numbers, perfect numbers, triangle numbers, square numbers and so on. Have you heard of Happy Numbers & Sad Numbers ? Let us take the number 44.

44 ... ... $4^2+4^2 = 32$ ... ... $3^2+2^2 = 13$ ... ... $1^2+3^2 = 10$ ... ... 1

The chain stops at 1. A happy number then, is one at the start of a number chain which stops at 1. Let's try some more numbers.

a) 19 ... ... $1^2 + 9^2 = 82$ ... ... $8^2 + 2^2 = 68$ ... ... $6^2 + 8^2 = 100$...1

b) 7 ... $7^2 = 49$ ... $4^2 + 9^2 = 97$ ... $9^2 + 7^2 = 130$ ... $1^2 + 3^2 = 10$ ... 1

Let's try smaller numbers

c) 2 ... [4] ... [16] ... 37 ... 58 ... 89 ... 145 ... 42 ... 20 ... [4]

You can see that 4 occurs twice, so that the chain won't ever stop, and every number in it must be sad—we cannot form a chain from that number which will end in 1.

Now look at the following chain.

d) 3.....9.....81.....65.....[61].... 37..... 58..... 89..... 145 ..... 42 ..... 20 ..... 4

Compare (c) & (d). We conclude that it does not make any difference whether it is 16 or 61; they eventually end in a 4 and the chain starts all over again. It could be even 106 or 601, they will all be the same.

Why then are the earlier numbers ending in 1 called happy numbers and those that go on to a chain are called sad numbers ? Is it because the 1 leads on to a 1, then a 1, then a 1 and on to the infinite, while the 4 takes us round and round, like the restless mind. Try and find out how many happy numbers there are, between 2 and 10.

Mrs. S. Sundararajan,
Director, Teacher Centre
Springdales School, New Delhi.

## YOUR ATTENTION PLEASE

The annual subscription for PATHWAYS is Rs. 8/-. Please send money orders/cheques to the Educational Planning Group, 4 Raj Niwas Marg. Delhi 110054. Pathways is issued in February, April, August and November each year. Subscriptions are valid for a calendar year. Those who join our subscribers later in the year will be sent the back numbers for that year. Remember to send your complete address with the M.O, including the PIN code number to avoid delay and losses in the post.

Some back numbers are available with us for Rs. 2.50 each (inclusive of postage).

# THE LAST STRAW ?

Having read the February 1983 issue of **Pathways** and the interesting "Straw Experiments (II)" article, may I add what one might tongue in cheek call the Last Straw ?

I have used straws in the following ways in Classes I-V

**Mathematics :**

Cut 300 to 500 **plastic** straws in half and bind with rubber-bands into bunches of 10. Ten bunches of ten can then be banded together to form a bunch of 100. With a few large and many small bandles which the class can manipulate, the teacher can demonstrate and the children will readily **understand** the concept of grouping by tens and hundreds.

Store in a box or a large plastic bag.

This is as useful for quick review as for initial teaching of the concept.

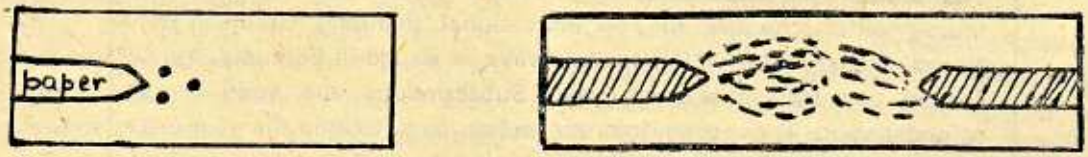
**Festival Art :**

For health reasons, paper straws are best for this activity because a child is less likely to use one that has previously been used by someone else.

A big drop of thinned poster paint (or even coloured ink) on a sheet of paper only needs a child to blow at it with a straw to spread it clear across the page in a crazy, seemingly haphazard; delightful "spray", as if it was a splash from a Holi 'pitchkari'.
Variations :

A. Paste a shaped piece of coloured paper at the edge of rectangular sheet of paper and drop paint as shown. If the child blows in the direction of the arrowhead, then the final effect will be as if the colours were being sprayed from a 'pitchkari'. (See figure)

B. Children could blow from opposite ends of the paper. The colourful effect at the centre can be quite explosive.




C. For a mural, draw and paste a Holi-revel scene on a long strip of paper. Stretch it out on the floor and "blow" paint from all the pitchkaries in the scene. Hang up when dry.

D. One can do the same thing any time of the year (minus the pitchkaris) and simply call the exercise **"drawing with the wind"**